MICHIG I DEPARTMENT OF NATUR/ RESOURCES

INTEROFFICE COMMUNICATION

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TO: Andrew Hogarth, Chief
Groundwater Compliance and Special Studies Section
Water Quality Division

FROM: Bill Fryer, Geologist
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SUBJECT: Impact on the Groundwater of Proposed Sinkhole Fill Project on Pt. Hennepin, Grosse Isle.

The sinkholes located on Pt. Hennepin, Grosse Isle, are interpreted as surface manifestations of vertical collapse into solution mining cavaties beneath the point. A model of the collapse structure suggest that a permeable pathway may develop throughout the vertical column of rubbleized rock and interconnect the strata. The sinkholes are relatively shallow conical depressions bottoming in the Detroit River Dolomite and penetrating the overlying clay and tailings.

An interpretation of the hydrology of the area can be based on observed hydraulic relationships and suggests that:

1. The sinkholes are hydraulically connected to the Detroit River Dolomite and possibly the Sylvania Sandstone. The connection is subject to plugging and two of the sinkholes are already partially isolated due to previous backfilling.

2. Groundwater flow in the surrounding drift is limited by low permeability, as demonstrated by the steep hydraulic gradients maintained between the river and the sinkholes. There is leakage from the river to the sinkholes and thence to the Detroit River Formation. Plugging the connection to the Detroit River Formation and backfilling should result in a water table at approximately river level and groundwater flow would approach the zero flow situation called for in the reports submitted. The relatively impermeable surface resulting at Pt. Hennepin and attention to surface drainage should insure that reverse flow from fill material to the Detroit River is minimized.

3. Aquifers beneath the Detroit River Formation are separate systems and the vertical interconnection is not effective.

The analyses of the leachates from the proposed fill material show a variety of contaminants and the zero flow situation postulated is desirable for isolating them. The effect of these leachates upon the overall quality of the water in the Detroit River Formation is minimized by the high H_2S concentrations generally found in wells tapping this formation. These H_2S saturated waters are considered unpotable and not suitable for industrial use. Grosse Isle receives water from the Detroit Supply System and would not be affected. It appears that all relevant concerns for the groundwater have been adequately addressed and protection provided. The only factor that has been left open is the permanent stability of the present structure beneath Pt. Hennepin with no further collapse anticipated.

BF:jys

William Fryer

Information concerning BASF's waste disposal activities was initially received from two private citizens who were closely acquainted with the company.

The first complaint was forwarded from Representative Tom Anderson's office on March 17, 1980, and dealt with hazardous wastes disposed of by BASF on the north end of Grosse Isle (Hennepin Point) several years ago. I contacted the complainant and he stated that while he was involved with BASF as part of a sub-contracting company, he witnessed many trucks of waste being hauled to Hennepin Pt. and buried---all at night.

He didn't know what the material was but did recall that it was extremely caustic and would destroy any footwear if walked in.

The complainant also stated that much of this material was leaching into the Detroit River.

The location he described to me was checked from a boat on April 22. It was readily apparent that the entire area had been used as a fill site for industrial wastes. There was no one area which appeared different than others, nor did I observe any leachate or wastes being washed directly into the surface of the Detroit River.

On August 25, 1980, David Batchelor and I met with another informant who stated he had firsthand knowledge of various illegal activities which had, and may still be occurring at the BASF North Works. He was specifically alleging serious violations at the company's Developmental Chemicals Plant. (pilot plant)

This complainant had originally called the Toxic Substance Control Commission with his charges and his name was then relayed to this office.

After I had talked to him on the phone twice, he agreed to meet me to relay more information and to point out the buildings/places in question at BASF.

Because of David Batchelor's background knowledge of the company's physical layout and processes, I requested his technical assistance.

The complainant had been an operator in the Developmental Chemical Plant - Basalin unit - while the company was producing Basalin. The information he offered concerned production and waste disposal practices in that unit. Basalin is the product name of a herbicide manufactured by BASF.

The charges made by the informant are of two general types; routine minor losses or deliberate dumpings, and major losses of several thousand gallons.

The charges made include the following:

1. That Basalin sludge from drums was routinely emptied onto the ground.

2. That a loss of several hundred gallons of Basalin waste was lost to the ground when the waste trailer developed leaks at the seals. This material was never recovered but was only covered over with fresh dirt. This occurred in the fall of 1978.

3. That a railroad tank car filled with Basalin wastes was lost to the ground. This was next to the Pilot Plant and happened in 1978. The complair said that several thousand gallons was involved. Much of this material endec up in a pond located just east of the Pilot Plant. This loss was investigate and confirmed by Water Quality personnel.

4. That there are many large storage tanks filled with various hazardous products or materials which have no diking or secondary containment. At least one of these large tanks (T-110) has a history of overflowing onto the ground regularly. This tank contained Basalin wastes.

5. That there are drum storage areas where sludges from drum bottoms is emptied and drums stored without any containment.

6. That leaking drums of Thinoyl Chloride are stored in a manner that material is washed into floor drains and ultimately to outfall 003.

7. In plant spills - which are common and routine - are washed down floor drains to 003.

The informant was able to draw a map showing areas where losses have occurred. He also stated that over a period of two years the DNR had been called only once even though several serious losses had occurred.

Before the complainant quit his job he obtained four samples of Basalin and Basalin waste by-products. He collected them on May 16, 1979. At the initial advice of the Toxic Substance Control Commission, he relayed the samples to the ERG lab in Ann Arbor. I picked up these samples and have them stored at our lab.

At the time of the interview the informant pointed out from the road the various buildings, tanks and drum storage areas in question.

Dave Batchelor, Conservation Officer Epskamp and I also took a boat down the Detroit River to check for possible illegal discharges from both the BASF South Works and the North Works. The South Works had been shut down and no discharges were observed.

On September 11 an aerial flight was made to gain photos of the North Works, specifically in the area of the Pilot Plant and east of it to the river. The resulting photos clearly show the tanks and drum storage areas, also indicate that the informants sketch was very true and accurate.

Also depicted in the photos is a large amount of yellow-colored material near the tanks on the west side of the Pilot Plant. According to the informant when I talked to him again on September 18, this yellow material is very likely still Basalin. He said that it turns yellow when exposed to the sunlight and air, and that only Acetone, Methanol or hot steam will remove it.

The same yellow stain can be seen near the drum storage pad where the complainant had said that Basalin sludges had been dumped onto the ground from the drums.

After talking to the latest informant it was decided that a complete file review should be conducted in order to determine the full extent of potentia problems at both the BASF North and South Works.

After completing such a review and talking to many individuals from the DNR and EPA who are knowledgeable of the company, it became clear that there is in fact considerable cause for concern.

There are numerous reports pertaining to large spills, losses and other discharges to both the ground and the river, which were hazardous in nature.

Frequent references are made and questions raised regarding the impacts of the confirmed losses on the area's groundwater and their ultimate impact on the river.

Many questions were also raised regarding the impact of the wastes disposed of on Fighting Island and Hennepin Point. Though these two sites aren't currently being considered for an intensive on site investigation, it appears that much of the same types of wastes have been disposed of or lost to the ground at their upland facilities.

A 1975 file memo makes reference to a site which "has all been filled with waste chemical sludges and/or product during the past 50 years." This same site is also the location where at least 15,000 gallons of Styrene was lost to the ground as the result of a leaking storage tank. (PEAS #1072

Based on the information learned from the files and various witnesses, an on-site inspection was conducted to gain a better understanding of the physical layout and appearance of the company property. We also wished to identify any obvious disposal sites, and to confirm the location and condition of the sites where the various losses had occurred.

In addition, this on-site inspection allowed our groundwater geologist to study possible drilling sites, access problems and soil conditions.

This inspection was held on November 17, 1980. Present were Roy Schrameck and Elmore Eltzroth of the DNR William Harris from the EPA and this writer.

We were accompanied by Mr. Dale Roush from BASF. Original contact had been made with Roush on November 13 and authorization was received from him on the 14.

After a short meeting in Mr. Roush's office where I explained our basic objectives, we proceeded to the South Works.

There were no readily apparent disposal sites at the South Works except for one area located in the far southeast corner of the facility, near the river. This area had been filled with demolition material according to Mr. Roush. I did observe two crushed drums at the north end of this site.

Roush also pointed out the location of the old mercury cell building which had been torn down in the early 1970's. The site is still vacant. It is located in the southwest portion of the South Works. DNR staff members still have concern relative to the mercury disposal.

A third area of potential concern was observed in the vicinity of the Urethane Research Laboratory, located at the north end of the South Works. At this location, situated just south of the lab, is an area of tainted soils and dead or missing vegetative cover. It is located immediately south and southwest of two large raised tanks designated as EC-14. This may be the site of a large spill.

At the North Works several sites where industrial waste or debris was dispose of were observed. It was not readily evident what was disposed of in these sites for the most part, as we did not do any digging or sampling as agreed to with the company.

The first site we inspected is located directly south of the transparent Iron Oxide building. Mr. Roush advised that demolition material and cinders were disposed of at this location. The area was covered with cinders. This location is straight west of the emergency brine storage pond. When asked what was in it, Mr. Roush simply stated "It's not another FMT site if that's what you mean."

A second area was observed west of the coal storage pile and east of the vitamin E plant. At this location Mr. Roush stated that Polyol filter cake was disposed of. It also appeared that other solid debris was placed in this site. Roush said that filter cake has been hauled away starting about a year ago.

A third and fourth area of possible concern are located at the old coke plant and the by-products plant on the east and west sides of the "old coke plant road" respectively. These locations are north and slightly east of the vitamin E plant. Messrs. Schrameck and Harris both stated that this location would be of high concern.

A final possible disposal site was observed at the southwest part of the Polyol plant area, located at the north end of the North Works. This is also the location of a large Styrene loss (15,000 gallons) which occurred in 1975.

This area has some observable demolition material in it and in addition information in department files suggests that it was used for disposal of waste chemical sludges. This sludge was discovered when trenches were dug to clean up following the styrene loss.

At the north end of this site is a small (approximately 20' square) pond of liquids wastes. It appears that there is a small trench which connects this pond to the polyol process area. It appeared that liquid wastes entered the pond through this small trench quite routinely as the trench was wet, and in some spots contained the same type of liquids in it as were in the pond.

A detailed site by site description is attached.

Other areas inspected include the emergency containment pond east of the pilot plant, and the vicinity immediately west of the pilot plant. We also inspected the vicinity of the drum pad located northwest of the pilot plant. It is highly probable that the pond sediments contain large amounts of various hazardous materials. It receives all material from inside and outside the pilot plant vicinity. Therefore any spills, losses or discharges onto the ground or into drains would end up in this pond.

The pond is part of the outfall 003N system. It has a central structure on the downstream end which is used to block passage in the event of a loss into the pond. Normal surface runoff and small spills into the pond would flow through unchecked. (Except for oil which would be caught by a permanent floating boom.)

The informant who used to work in the Pilot Plant stated that losses in and around the building were very common. Most materials in suspension would likely precipitate out upon reaching the pond, producing a potentially hazardous buildup of sludges. It could not be determined whether or not the pond has an impermeable base.

The ex-employee claimed that BASF employees are occasionally told to take a rowboat into the pond to stir up the bottom sediments in order to wash them out of the pond and ultimately into the river.

INVESTIGATION OBJECTIVES:

Departmental objectives are to gain access to both the North and South Works at BASF to conduct an intensive survey. By such a survey the department hopes to identify any and all disposal sites where BASF or their predecessors may have disposed of chemical wastes. Secondly the department hopes to substantiate the strong possibilities of groundwater contamination and its subsequent impact on the Detroit River.

These objectives will be achieved by utilizing our well drilling equipment and drilling a large number of wells for the purposes of collecting groundwater samples and core samples.

In addition, wells will be drilled up gradient for background water samples and downgradient in order to determine flow of contaminants.

A complete drilling plan is attached.

It is the department's belief that once a hazardous condition has been documented and substantiated, relief in the form of possible civil litigation will be made possible. This relief would likely include the company conducting a complete hydrogeological survey of their property, and the adequate containment or removal of buried hazardous wastes.

Information received by this investigation will also allow the department to address the company's NPDES permit issues more accurately. Any groundwater impacts on the river must be known so that permit limitations can be adjusted accordingly.

The investigation will be a joint effort between the DNR and EPA. The EPA lab will do some of the analysis, and they wish to have a man on scene as well.

SPECIFIC SITES:

Site #1

Located at the north end of the North Works, this site appears from the surface to contain a large amount of solid or demolition debris. In 1975 a very large loss of styrene resulted in some trenching in this vicinity. At this time it was discovered that waste chemical sludges had been buried here.

This site is immediately adjacent to the polyol process facility. There is a small pond of liquid wastes at the north end of the site.

Likely contaminants at this site include the following: Hexachlorobutadiene; Hexachlorobenzene; 2-chloropropanol; Acetone; chloroacetone; 1, 2-dichloropropane; 1, 1, 1, -Trichloroethane; Chloroform; 1, 2, 3 - Trichloropropane; Chlorinated phenols; epichlorohydrin; benzene; styrene; Toluene; Xylene; Acrylonitrile, among others.

Site #2

This location is the site of an old coke production and by-products area. It is situated just east of site #1. Technical experts in the department feel that this site is of high concern because of the high potential for contamination inherent with this process. Contaminants would include: Benzene; ethylbenzene; Styrene; Cyclopentadiene; Cresols; Phenols; Xylenols; Toluene; xylene; as well as heavy metals.

Site #3

Site three is a large disposal location situated south and east of numbers (1) and (2). It is immediately adjacent to the large coal pile in the North Works, being on the west side of it. Mr. Roush of BASF stated that they used this site for the disposal of filter cake sludge from the polyol plant. He said that they used the site for this purpose up until about a year and a half ago. It is quite a bit larger than sites (1) or (2).

Contaminants likely to be found in this site closely resemble those found in site (1).

Sites 4 and 5:

These two locations are at the south end of the North Works, and are separated only by a railroad track. Mr. Roush stated that both areas had been used for the disposal of solid waste, but claimed that no hazardous materials are buried there. Both sites are currently covered over with cinders.

If process wastes are buried here, the contaminants present would likely include all those previously outlined in sites (1), (2), and (3).

Site #6:

Site number six is located in the southeast portion of the South Works. It is situated close to the river and was used for the disposal of solid debris according to Mr. Roush.

A wide list of inorganic compounds including asbestos and toxic heavy metals associated with the chloro-alkai process could be found here.

Organic substances likely to be found include a long list of chlorinated organics.

This site has been bulldozed over but I did observe two crushed drums at the north end of the site.

Site #7:

This site is located at the north end of the South Works, near the urethane research lab. It is an area of dead or missing vegetation adjacent to an old tank storage site. There is also a considerable amount of tainted soil which may have resulted from a tank loss.

Site #8:

This is the site of the building which had contained the mercury cells before it was demolished. The location is still vacant and appears to be covered over with cinders. Because of some question as to the utlimate disposal of the mercury wastes and contaminated materials, it is felt that an inspection at this site is desirable to determine any unauthorized unsafe burial of wastes.

ADDITIONAL SITES:

The final sites are small areas near the Developmental Chemicals building. One is near the "North Drum Pad" where Basalin sludges were emptied onto the ground from drums, and the second is immediately west of the Pilot Plant where several large losses allegedly occurred. The ground is still stained yellow at these two locations - typical of Basalin spills.

A final site is the "Emergency Containment Pond" located on the east side of the Pilot Plant. As indicated earlier, many hazardous materials make their way into this small pond from both inside drains and outside surface run-off. This is a flowing pond and is part of the 003N outfall. There is also some question as to its impermeability.